

AMENDMENTS TO THE CLAIMS

1-83. (Canceled)

84. (Previously Presented) A method of predictably enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, and of producing a protein feed or feed supplement end product having a crude protein content of over about 30% of the feed or feed supplement end product composition on a dry matter basis, and at least one of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;

creating a distillers, brewers or fermenters grain by-product-nutrient source mixture having an enhanced nutrient value by (a) adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters by-products based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and (b) adjusting the temperature and/or the moisture content of the enhanced nutrient value by-product-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

85. (Previously Presented) The end product made by the process of claim 84.

86. (Previously Presented) The method of claim 84, wherein the upper level of the amino acids as a percentage of the RUP/UIP is about 2% for methionine and about 7% for lysine.

87. (Previously Presented) The method of claim 84, wherein the rumen undegradable protein (RUP/UIP) of the wet byproducts-nutrient-source mixture is increased in a range of from about 27% to about 83%.

88. (Previously Presented) The method of claim 84, wherein the end product moisture level is in a range from about 0% to about 14%.

89. (Previously Presented) The method of claim 84, wherein the UIP of the wet by products-nutrient-source mixture, on a crude protein basis, is increased by about 115 percent; methionine, as a percentage of UIP, is increased about 30 percent; UIP methionine, as a percentage of dry matter, is increased by about 179 percent; lysine, as a percentage of UIP is decreased by about 3.4 percent; and UIP lysine, as a percentage of dry matter, is increased by about 108 percent.

90. (Previously Presented) The method of claim 84, wherein the UIP of the wet byproducts-nutrient-source mixture, on a crude protein basis, is increased by about 108 percent; methionine, as a percentage of UIP, is increased about 30 percent; UIP methionine, as a percentage of dry matter, is increased by about 169 percent; lysine, as a percentage of UIP is decreased by about 1.0 percent; and UIP lysine, as a percentage of dry matter, is increased by about 111 percent.

91. (Previously Presented) The method of claim 84, wherein the distillation and/or fermentation by-product-nutrient source mixture having an enhanced nutrient value is a mixture of about two-thirds wet corn distillers grains and about one third high protein soybean meal.

92. (Previously Presented) The method of claim 84, wherein the end product crude protein is in a range up to about 54 percent of the end product composition.

93. (Previously Presented) The method of claim 84, wherein the end product UIP is in a range from about 63% to about 83 percent of the end product composition.

94. (Previously Presented) The method of claim 84, wherein the UIP content of the end product has a pepsin digestibility in a range of about 74% to about 94%.

95. (Previously Presented) The method of claim 84, wherein the crude protein range in the end product is from about 30% to about 58%; the UIP range in the end product is from about 63% to about 83% of the crude protein; and the post ruminal pepsin digestibility range is from about 63% to about 94% of the UIP.

96. (Previously Presented) The method of claim 84, wherein the bypass protein (RUP/UIP) level of the end product is increased to between one and one-fourth times and approximately two and one-half times the original level of the byproduct-nutrient-source mixture, wherein the RUP/UIP in the end product is from about 50% up to about 83% of the crude protein level.

97. (Previously Presented) The method of claim 84, wherein the temperature of mixture is increased to a range of about 208 degrees Fahrenheit to about 210 degrees Fahrenheit.

98. (Canceled)

99. (Previously Presented) The method of claim 84, wherein the temperature is adjusted to achieve an end product temperature in a range of from about 211 degrees Fahrenheit to about 223 degrees Fahrenheit.

100. (Previously Presented) The method of claim 84, wherein the temperature is in a range that causes denaturation of the protein of the by-product-nutrient source mixture.

101. (Previously Presented) The method of claim 84, wherein temperature of the by-product-nutrient-source mixture is adjusted in a range from about 180°F to about 250°F.

102. (Previously Presented) The method of claim 84, wherein the temperature of the by-product-nutrient-source mixture is adjusted to be about 218°F.

103. (Previously Presented) A method of predictably enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, and of producing a protein feed or feed supplement end product having a crude protein content of over about 30% of the feed or feed supplement end product composition on a dry matter basis, and at least two of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;

creating a distillers, brewers or fermenters grain by-product-nutrient source mixture having an enhanced nutrient value by (a) adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet brewers, distillers or fermenters byproducts based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and (b) adjusting the temperature and/or the moisture content of the enhanced nutrient value by-product-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

104. (Previously Presented) The end product made by the process of claim 103.

105. (Previously Presented) A method of predictably enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, and of producing a protein feed or feed supplement end product having a crude protein content of over about 30% of the feed or feed supplement end product composition on a dry matter basis, and a UIP/RUP content of over 50% and up to about 83% of the crude protein, amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, and a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;

creating a distillers, brewers or fermenters grain by-product by-product-nutrient source mixture having an enhanced nutrient value by (a) adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters byproducts based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and (b) adjusting the temperature and/or the moisture content of the enhanced nutrient value by-product-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

106. (Previously Presented) The method of claim 105, wherein the bypass protein (RUP/UIP) level of the end product that is over 50% and up to about 83% of the crude protein is adjusted and is increased in a range from approximately one and one-fourth times to approximately two and one-half times the bypass protein (RUP/UIP) level in the starting by-product-nutrient-source mixture.

107. (Previously Presented) The end product made by the process of claim 105.

108. (Previously Presented) The end product made by the process of claim 106.

109. (Currently Amended) A system for predictably enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, and for producing a protein feed or feed supplement end product having a crude protein content of over 30% of the feed or feed supplement end product composition on a dry matter basis, and at least one of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein of, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) having a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

~~system determining means for determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;~~

system mixing means apparatus for creating mixing a distillers, brewers or fermenters grain by-product-nutrient source mixture having an enhanced nutrient value by adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, fermenters or brewers byproducts based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and

system adjusting apparatus means for adjusting the temperature and/or the moisture content of the enhanced nutrient value by-product-nutrient source mixture based on an

empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product, .

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

110. (Previously Presented) The system of claim 109, wherein the bypass protein (RUP/UIP) level of the end product is increased to between one and one-fourth times and approximately two and one-half times the original level of the byproduct-nutrient-source mixture, wherein the RUP/UIP in the end product is about 50% and up to about 83% of the crude protein levels.

111. (Currently Amended) The system of claim 109, wherein the system adjusting apparatus means is provided for providing the temperature in a range that causes denaturation of the protein of the by-product nutrient source mixture.

112. (Previously Presented) A method of predictably enhancing the nutrient value of distillers, brewers or fermenters grain solubles, and of producing a protein feed or feed supplement end product having a crude protein content of over 30% on a dry matter basis of the feed or feed supplement end product composition, and at least one of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) having a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;

creating a distillers, brewers or fermenters grain by-product solubles-nutrient source mixture having an enhanced nutrient value by (a) adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet

distillers, brewers or fermenters solubles based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and (b) adjusting the temperature and/or the moisture content of the enhanced nutrient value solubles-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

113. (Previously Presented) The end product made by the process of claim 112.

114. (Previously Presented) A method of predictably enhancing the nutrient value of distillers, brewers or fermenters grain solubles, and of producing a protein feed or feed supplement end product having a crude protein content of over 30% on a dry matter basis of the feed or feed supplement end product composition, and at least two of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) having a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;

creating a distillers, brewers or fermenters grain by-product solubles-nutrient source mixture having an enhanced nutrient value by (a) adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters solubles based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and (b) adjusting the temperature and/or the moisture content of the enhanced nutrient value solubles-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the

crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

115. (Previously Presented) A method of predictably enhancing the nutrient value of distillers, brewers or fermenters grain solubles, and of producing a protein feed or feed supplement end product having a crude protein content of over 30% on a dry matter basis of the feed or feed supplement end product composition, and (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, and (3) having a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;

creating a distillers, brewers or fermenters grain by-product solubles-nutrient source mixture having an enhanced nutrient value by (a) adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters solubles based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and (b) adjusting the temperature and/or the moisture content of the enhanced nutrient value solubles-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner to produce said end product.

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

116. (Currently Amended) The method of claim 115, wherein the bypass protein (RUP/UIP) level of the end product that is over 50% and up to about 83% of the crude protein is increased to approximately 2.44 times the bypass protein (RUP/UIP) level in the wet distillers, brewers, or fermenters grains before the crude protein, and/or amino acid content nutrient sources are added, starting by product solubles-nutrient source mixture.

117. (Previously Presented) The end product made by the process of claim 114.

118. (Previously Presented) The end product made by the process of claim 115.

119. (Currently Amended) A system for predictably enhancing the nutrient value of distillers, brewers or fermenters solubles, and for producing a protein feed or feed supplement end product for having a crude protein content of over 30% on a dry matter basis of the feed or feed supplement end product composition, and at least one of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) having a post ruminal digestibility of the UIP/RUP of over 60%, and up to about 94% comprising:

~~system determining means for determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;~~

system determining mixing apparatus means for creating mixing a distillers, brewers or fermenters grain by-product solubles-nutrient source mixture having an enhanced nutrient value by adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters solubles based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and

system adjusting apparatus means for adjusting the temperature and/or the moisture content of the enhanced nutrient value solubles-nutrient source mixture based on an empirically

derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner is provided for producing said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

120. (Currently Amended) A system for predictably enhancing the nutrient value of distillers, brewers or fermenters solubles, and for producing a protein feed or feed supplement end product for having a crude protein content of over 30% on a dry matter basis of the feed or feed supplement end product composition, and at least two of (1) a UIP/RUP content of over 50% and up to about 83% of the crude protein, (2) amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, or (3) having a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

~~system determining means for determining the desirable levels of crude protein, UIP/RUP, amino acids and post ruminal digestibility in an end product;~~

system determining mixing apparatus means for creating mixing a distillers, brewers or fermenters grain by-product solubles-nutrient source mixture having an enhanced nutrient value by adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters solubles based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources to create an enhanced nutrient value by-product-nutrient source mixture of the distillation or fermentation byproducts; and

system adjusting apparatus means for adjusting the temperature and/or the moisture content of the enhanced nutrient value solubles-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner is provided for producing said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

121. (Currently Amended) A system for predictably enhancing the nutrient value of distillers, brewers or fermenters solubles, and for producing a protein feed or feed supplement end product having a crude protein content of over 30% on a dry matter basis of the feed or feed supplement end product composition, and a UIP/RUP content of over 50% and up to about 83% of the crude protein, amino acid levels in the crude protein and in the RUP/UIP of greater than 1% and up to about 2% methionine and 2% and up to about 8% lysine, and having a post ruminal digestibility of the UIP/RUP of over 60% and up to about 94%, comprising:

~~system determining means for determining the desirable levels of crude protein, UIP/RUP, amino acids and post-ruminal digestibility in an end product;~~

system determining mixing apparatus means for creating mixing a distillers, brewers or fermenters grain by-product solubles-nutrient source mixture having an enhanced nutrient value by adding one or more crude protein and/or amino acid content nutrient sources comprising canola meal, soybean meal, sunflower meal into wet distillers, brewers or fermenters solubles based on the crude protein, UIP protein, amino acid content, UIP/RUP amino acid content of the added nutrient sources; and

system adjusting apparatus means for adjusting temperature and/or the moisture content of the enhanced nutrient value solubles-nutrient source mixture based on an empirically derived relationship that relates the UIP as a percent of the crude protein (CP) to an end product temperature in a predictable and repeatable manner is provided for producing said end product,

wherein the empirically derived relationship that relates the UIP as a percent of the crude protein (CP) is adjusted according to the following formula:

$$\text{UIP (\% of CP)} = (\text{End Product Temperature } ^\circ\text{F} \times 0.819) - 107.644.$$

122. (Currently Amended) The system of claim 119, wherein the system adjusting apparatus means for providing a bypass protein (RUP/UIP) level of the end product that is over 50% and up to 83% of the crude protein increases the bypass protein (RUP/UIP) level to approximately 2.44 times the bypass protein (RUP/UIP) level in the wet distillers, brewers, or

fermenters grain by-product solubles before the crude protein, and/or amino acid content nutrient sources are added starting by product solubles nutrient source mixture.